

CLAIMS

Claim 1. An apparatus for the thermal spray delivery of a solution, said apparatus comprising:

- a first solution reservoir;
 - a second solution reservoir;
 - a singular or multiple liquid injector(s) disposed in fluid communication with said reservoirs;
 - a flame source configured to direct a thermal spray from said liquid injector to a substrate; and
 - a thermal control device disposed in thermal communication with said substrate.
- a chamber enclosing the thermal spray gun and substrate which facilitates use of inert gas blanketing

Claim 2. The apparatus of claim 1, further comprising control valves disposed at respective outlets of said reservoirs.

Claim 3. The apparatus of claim 1, further comprising a mixer disposed at an outlet junction of said reservoirs.

Claim 4. The apparatus of claim 1, wherein said reservoirs are disposed in fluid communication with each other.

Claim 5. The apparatus of claim 1, wherein said reservoirs are pressurizable to provide a driving force for a solution disposed therein.

Claim 6. The apparatus of claim 5, wherein said reservoirs are pressurizable with a gas selected from the group of gases consisting of air, nitrogen, argon, and helium.

Claim 7. The apparatus of claim 5, wherein said reservoirs are pressurizable to about 5 psi to about 80 psi, either via gas from claim 6, or via a pump.

Claim 8. The apparatus of claim 5, wherein said reservoirs are pressurizable to about 20 psi to about 50 psi.

Claim 9. The apparatus of claim 1, wherein said liquid injector(s) comprise(s), a solution channel from which said solution is received from said reservoirs, an injector nozzle axially disposed at said solution channel, and an atomizing gas chamber fed by said injector nozzle.

an air cap injection nozzle configured to control atomized liquid precursor spray pattern.

Claim 10. The apparatus of claim 9, wherein said air cap injection nozzle comprises: an outlet opening having an orientation selected from the group of orientations consisting of angular openings, elliptical openings, round openings, and combinations of the foregoing openings;

a configuration which precludes nozzle tip fouling.

Claim 11. The apparatus of claim 10, wherein said cap comprises a planar face perpendicularly oriented relative to a direction of flow from said outlet of said injector nozzle.

Claim 12. The apparatus of claim 9, wherein an atomizing gas is received through said atomizing gas channel at a pressure of about 5 psi to about 80 psi.

Claim 13. The apparatus of claim 9, wherein an atomizing gas is received through said atomizing gas channel at a pressure of about 20 psi to about 50 psi.

Claim 14. The apparatus of claim 9, further comprising a cleaning assembly disposed in fluid communication with said solution channel.

Claim 15. The apparatus of claim 14, wherein said cleaning assembly comprises,
a pin disposed in said solution channel,
an air inlet disposed at said solution channel,
a control valve disposed in fluid communication with said air inlet, and
a timer disposed in communication with said control valve.

Claim 16. The apparatus of claim 1, wherein said liquid injector comprises:
a solution channel from which said solution is received from said reservoirs,
an injector nozzle axially disposed at said solution channel.
a pressured gas or mechanical or electric force driven injection nozzle to generate
a precursor spray stream and pattern..

Claim 17. The apparatus of claim 1, further comprising a liquid injector cooling and
purging system disposed in fluid communication with said atomizing liquid injector, said
liquid injector cooling and purging system comprising,
an inlet through which a fluid is received,
an outlet through which said fluid is delivered to said atomizing liquid injector,
and
a control valve configured to control the flow of said fluid.

Claim 18. The apparatus of claim 1, wherein said substrate thermal management
system comprises,
a heat source,
a coolant source, and
temperature monitoring devices.